IDENTIFICATION OF FACTORS INFLUENCING UNDERREPRESENTED STUDENTS CHOOSING FOOD SCIENCE RELATED DEGREES IN COLLEGE

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ABSTRACT

The focus of the study was to investigate influential factors impacting students when deciding on a major/career path. Four different target audiences were assessed including: high school counselors/teachers, high school participants of an agriculture outreach program, participants in Leaders in Food Technology summer program, and the Fall 2017 Angelo State University student body. Results from focus groups that were given a pre and post-survey indicate administering information on agriculture based careers increases confidence and likelihood to pursue a career in agriculture ($P \leq 0.05$). Additionally, the outreach program improved students' ability to correctly identify career options within the agriculture field ($P \leq 0.05$). Results from this study help identify influential factors in order to address them to improve recruitment and retention of underrepresented students in the agriculture field. Results from ASU campus survey highlight the need for recruiters to provide information on career opportunities as part of their recruitment efforts.

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INTRODUCTION

In recent years there has been an increased employment need for students educated in science, technology, engineering and mathematics (STEM) that directly relate to food science (Hegerfeld-Baker et al., 2015). Science, technology, engineering and mathematics (STEM) programs work with studies such as: food science, meat science, and food microbiology support careers within the food and agriculture industry. The United States Bureau of Labor Statistics (USBLS) (2012) projects an increased need of 10% for professionals with degrees in agriculture and food science from the year 2010 to 2020. By the year 2050, producers will need to increase the global food production about 50% to keep up with the increase in population (Floros et al., 2010). This will increase the food safety and quality professional job opportunities for new graduates. However, some college graduates may not meet the education qualifications for these careers. The Association of Public Land-Grant Universities (APLU, 2009) projects that only 55% of the increase need can be met by current qualified professionals. These statistics emphasize the need for graduates who are educated in agriculture and food science related majors. Consumers drive the food industry. Consumers want safe products to bring home to their family. Producers want to make this possible by producing safer quality products. One way to help consumers and producers feel safer about their products is by hiring well trained and educated food safety professionals. In order to increase the number of well-educated and trained food safety professionals in the work force, universities with related academic departments must first increase enrollment of students within associated degree programs.

The objective of this study was to evaluate four different focus groups to understand the influential factors students may encounter when deciding on a major or career path, specifically what may aid in educating those students in career opportunities in agriculture. The information collected from the study will aid in improving recruitment and retention of students into the food science and agriculture industry.

LITERATURE REVIEW

In order to increase enrollment, universities are encouraged to focus on improving the ability to recruit and retain students into agriculture and food science majors/programs (APLU, 2009). Recruiting students into a specific degree path comes with its own set of challenges. An example of one these challenges is students' background knowledge of the subject. Stevenson et al. (2014) found students who do not have a background in the food industry may be 2.2 times less likely to choose a major associated with food industry. Food science as a career is not widely recognized by many high school students (Roberts et al., 2010).

There can be many reasons students do not recognize food science as a career. Universities should help potential students understand the many opportunities in the agricultural field to aid in recruitment efforts. Moreover, universities also need to be able to retain those students expressing interest in the field of study. Mau (2016) stated in general, low participation and completion of studies in college is a national and global concern. Universities should evaluate their current recruitment and retention strategies to assess their effectiveness on underrepresented student groups. The National Institute of Food and Agriculture (NIFA), a sector of the USDA, funds a Hispanic-Serving Institution grant program. NIFA has identified the need to increase the number of qualified and diverse graduates who are seeking higher employment in food science and the agriculture industry. Moreover, NIFA funds many educational efforts in hopes of meeting their goal at increasing the underrepresented populations into government positions. By increasing the number of minority students graduating in these fields of study, it helps increase the likelihood of those

students filling government positions related to agriculture; this increase would help modify the ethnic demographic within the USDA to more closely match the countries demographics (HSI, 2012). Recruitment and retention of different underrepresented populations, like ethnic minorities or low socioeconomic populations may present unique challenges when compared to the majority of students going into higher education. One study focused on understanding of inequality with Hispanic students pursing higher education (O'Connor et al., 2010). The study found that Hispanic students are less likely to finish a four year degree plan because they have less access to information about higher education and financial aid. Additionally, O'Connor et al. (2010) stated that universities should supply high school students increased access to information about higher education, degree attainment, and increase recruitment of minorities for enrollment and retention purposes. By doing so, universities are expressing interest in minorities directly. This allows the universities to become involved on a personal level with potential students.

In today's society, many different groups are identified as underrepresented or a minority. New Webster's II (1984) defined underrepresented minority groups as, "any racial, religious, political, national, or other group thought to be different from a larger group of which it is a part of". Some examples of different underrepresented groups are an ethnic/cultural minority**,** first generation college students, and low socioeconomic populations. Recruiting different underrepresented groups into agricultural based studies can be important to universities as well as the government. One study found it imperative to recruit all intelligent and motivated people to be agriculturalists for the future of agriculture (Jones and Larke Jr, 2001). Many food safety and quality professional positions are

government based. Increasing the number of underrepresented students graduating in agriculture related fields can potentially increase the number of these students pursuing careers in food science and agricultures. Universities should focus on producing qualified students to help reflect that diversity within the nation, as well as state and region. A study by Mullinix and Garcia (2006) stated that the long-term prospects for agriculture in the United States depend on the effort universities put forth to attract, educate, and retain agriculturalist. Texas Education Agency (2014) data reported in 2014, 28.5% of enrolled students at Angelo State University (ASU) were Hispanic and/or another ethnic minority. In addition, a study by Morse and Hammer (1998) found that Latinos are traditionally underrepresented in higher education. Research data such as this indicate the increased need to recruit minorities, such as Hispanics, into the food science and agriculture field of study. Jones et al. (2009) explained that minority students are scarce in university agriculture programs. Moreover, it is possible that universities who improve retention rate of these students can help the underrepresented populations with academic development and career attainment in their degree program.

When dealing with unrepresented populations, there are often additional challenges associated with each underrepresented group. Examples of some of these factors include low interest in seeking careers into specific industries and low graduation rates of underrepresented students. Misunderstandings of job opportunities, field of study, and competitive wages in agricultural careers could affect recruitment of students into the associated field of study. Additionally, underrepresented students may have a negative perception of agriculture, making a large obstacle for universities to overcome. Scanlon et al. (1989) suggested minority students have negative feelings associated with agriculture

careers. Challenges associated with these underrepresented groups must be taken into account when recruiting students into agricultural programs. Another challenge is cultural backgrounds. Being aware of cultural backgrounds is a must because culture is often important in the recruitment of students (Gilroy, 2010). Some students may not have had experience or been exposed to certain topics, like agriculture studies. A study done by Courtney et al. (2016) surveyed 491 undergraduate students on their knowledge of food safety. The study found that two out of every five respondents had taken a course related to food safety. However, taking a course does not always debunk misconceptions of the agriculture industry. Gilmore et al. (2006) found 41% of high school students have misconceptions of agriculture sciences. Wiley et al. (1995) explained minorities do not understand that majoring in agriculture covers more than just working on a farm. Moreover, students may believe the food industry has a limited number of job positions related to food safety. Gilmore et al. (2006) found 33% of high school students lacked knowledge of employment opportunities within the industry. Roberts et al. (2010) also found high school students did not recognize the field of food science as a career. These are just a few of the statistics providing evidence as to why certain students feel or think the way they do about agriculture.

Another factor that may influence a minority student when choosing a major is work experience. Stevenson et al. (2014) determined that students with experience in the food industry may be more likely to choose food science as a career path. In addition, 46% of community college students and 19% of high school students considered a career in food science after working in the industry. Stevenson et al. (2014) also found only 9% of minority

students would consider careers in food science verses 19% of non-minorities. Supplying evidence for the need of targeted education efforts towards underrepresented students in food science and agriculture related majors.

Relationships such as friendship, family, and academia may also be a contributing factor to students having less of an interest in the food industry. Ferry (2006) found three reemerging themes for factors influencing a student's decision making; family, school, and community. However, Hegerfeld-Baker et al. (2015) found no significant difference in relationships affecting choice of major. Some other factors that may influence a student's choice of choosing a food science or agricultural field of study may be personal gains, extracurricular activities, and life goals (Hegerfeld-Baker et al., 2015). In addition, financial gain, family responsibilities, lack of mentors, and language barriers could also play a challenging role in recruitment (Mullinix and Garcia, 2006). These are just a few challenges that are known when recruiting underrepresented students.

Lastly, many research studies have focused on one demographic or one specific focus group. The results from previous studies indicate the need to recruit students into the food science and agriculture field of study/career as well as understand influential factors students may come across. By doing so, this will help universities with recruitment and retention strategies for underrepresented populations into the food science and agriculture field of study. This will be beneficial for the future of agriculture as a whole with an increase of well-educated individuals in the food and agriculture industry.

MATERIAL AND METHODS

All procedures were summited and approved by the IRB committee (BRA-092517 and BRA-080317)(Appendix A). For this research, four different populations were surveyed. Copies of all surveys can be found in the Appendix. The four groups included high school counselors/teachers, high school students involved in an Angelo State University Agriculture Department outreach program, students that participated in Leaders in Food Technology (LIFT) summer program, and students enrolled at Angelo State University in the Fall semester of 2017 (not including dual credit students). The first three groups were given a variety of information on the study of agriculture, careers in agriculture and available degrees at ASU as part of research and outreach efforts. The information was provided in two different formats, either in paper pamphlet format or electronic pamphlet format with a presentation, career informational video and the AgForLife model. The AgForLife map is an illustration demonstrating career tracks in agriculture (AgForLife®, LLC, 2012). Students attending ASU Fall semester 2017 did not receive information prior to taking the survey. The purpose of the investigation was to identify factors influencing the students' decision making process when choosing a career field/major. For the parameters of this study "underrepresented" was defined as meeting one of the three possible criteria. The first criteria included students whose ethnicity was defined as not being the majority white/Caucasian race. "In the United States, racial/ethnic minorities are generally considered to include Hispanic/Latinos, African Americans, Asians, Native Americans, Hawaiian/Pacific Islanders and those of two or more races" (Penn State, 2017). The other acceptable qualifiers included students who were considered to be first generation students and/or students at a low

socioeconomic level. For this study, first generation is defined as a student whose parent(s) or guardian(s) have not completed a bachelor's degree. In addition, a student qualified as being in a low socioeconomic level is if he or she was eligible for Pell grant status based on their financial documentation.

High School Counselors/Agricultural Teachers Survey

High school counselors and agricultural teachers have been identified as individuals who influence students choosing agriculture as a degree path (Swortzel, et al. 2006). In order to assess their knowledge of career opportunities in agriculture, a pre-survey was sent to high school counselors and agricultural teachers from 225 high schools in the state of Texas (Appendix B). High schools were chosen based on publicly available information that identified these schools as having a large percentage of underrepresented students.

Additionally, schools were emailed a resource packet that contained an informational career video, as well as information on degree opportunities in the agricultural department at ASU. The informational resource packet included pamphlets and other documentation explaining career opportunities in agriculture, student programs within the meat and food science degree at ASU, scholarship opportunities, and university contact information. Furthermore, packets included links to the ASU website that include information on courses offered to students and other educational opportunities. The instructors and counselors were then asked to complete a post-survey after having reviewed the provided information (Appendix B). The pre and post-surveys were administered using Qualtrics and results were analyzed using various procedures of Statistical Analysis Software (SAS).

High School Outreach Program

Using similar criteria as the previous survey, the research study identified 38 representative schools to visit and conducted an outreach event at each school. After researchers received signed parent informed consent forms, students received a pre-survey, administered in paper form, prior to the outreach event assessing their knowledge of food and agricultural science careers (Appendix C). During the outreach event the presenter distributed information on the wide varieties of career opportunities in agriculture, introduction to the Ag for Life Map, and information on degree programs available at the university that can lead to those careers. Additionally, the presenter conducted a hands-on experiment, called Glo-Germs, to get students interested in food science and agricultural studies. The experiment was the same for each school. After the outreach event was completed, students were given a post-survey administered in paper form (Appendix C). Surveys displayed identification numbers that helped ensure the same respondent was taking the pre-survey and post-survey. Survey responses were analyzed using SAS.

One large outreach event was selected to only receive post-survey due to time restrictions of the outreach event. The presenter visited with three different class periods which contained four classes each. As with other schools, the presenter distributed information on the wide varieties of career opportunities in agriculture, introduction to the Ag for Life Map, and information on degree programs available at the university that can lead to those careers. Additionally, the presenter conducted a hands-on experiment and selected 5-6 students from each period to participate in order to get students interested in food science and agricultural studies. After the outreach event was completed, students were

given a post-survey administered in paper form (Appendix C). After confirming no result differences linked to the specific event the data from this set was pooled with all other post-surveys for analyzing complete data set. Changes in students' responses or knowledge in career opportunities from all surveys received were assessed using various procedures of SAS.

Leaders in Food Technology (LIFT) Summer Program

Another group that was selected using the same underrepresented criteria as the previous surveys included students participating in the LIFT Summer Program. Students were chosen to receive the opportunity to participate in the program based on their qualification as an underrepresented population and their chosen degree field. The summer program is aimed at igniting an interest in students to pursue careers in food and meat sciences, as well as helping students acclimate to campus life prior to the fall semester starting. The program consisted of students gaining information on food and meat sciences, participating in hands-on product development experiments, and attending presentations on campus about the opportunities available to new students at ASU. After the program, students received a post-survey administered through Qualtrics (Appendix D). The results from the survey helped assess the effectiveness of the summer program. Student responses were collected via Qualtrics and analyzed utilizing various procedures of SAS.

ASU Student Campus Survey

The last group involved in this research included students at ASU. An email containing a link to an online survey was emailed to all students who were enrolled at ASU

during the Fall 2017 semester. The questions of the survey focused on the overall student populations' knowledge on careers in agriculture (Appendix E). Additional questions focused on general influential factors specific to ASU students, when choosing their initial degrees as well as when that decision was made. Out of the students attending ASU in the Fall 2017 semester, 519 surveys were completed.

Statistical Analysis

All surveys that were received back from each of the groups were analyzed using various procedures of SAS. Difference between pre and post-survey responses were analyzed and question responses were processed using the frequency procedure of SAS to compile descriptive statistics. Target comparisons of certain questions were conducted to ascertain differences between different demographic groups. Differences in scaled responses were analyzed using the Mixed Procedure of SAS, while categorical data was analyzed using the chi square analysis. A predetermined *P*-value of = 0.05 was utilized to determine significant differences between responses.

RESULTS AND DISCUSSION

High School Counselors/Agricultural Teachers

Surveys were emailed to teachers and counselors at 225 high schools across Texas. Of those who received the email, only 37 pre-surveys (response rate of 8.2%) and 20 post-surveys (response rate of 4.4%) were fully completed. The majority (55%) of the teacher and/or counselors who completed the survey were female (Table 1). Furthermore, 95% of the respondents marked White (Not Hispanic) as the race they closely identify as (Table 1). Most of the respondents (50.00%) were high school counselors; 45.00% were high school agriculture teachers and 5.00% were non-ag teachers.

There are a wide variety of job opportunities within the agriculture field. Some reports estimate there are approximately 2,700 U.S. positions in food science and other closely related fields that remain vacant due to the decline in enrollment in food science programs (Gilmore et al., 2006). When asked if high school counselors/teachers believed there are a wide variety of job opportunities in the food and agriculture industry in the pre-survey, 100% answered yes. The results stayed the same for the post-survey (100%). In addition, a follow up question asked their confidence in regards to being able to provide information to students interested in entering a food and/or agriculture science program if they came with questions about opportunities in that field. Pre-survey results indicated 52.63% of the respondents felt they were confident in their ability/knowledge to answer students' questions about the food and agriculture industry. After providing information on the topic, an increase of 27.37% ($P = 0.04$) in personal confidence of having information

Table 1. Demographic characteristics of study participants of high school counselor/teachers who completed post-survey (n=20)

Demographic Characteristics	Frequency	Percent of Respondents
Ethnicity		
Hispanic or Latino	1	95.00
White (Not Hispanic)	19	5.00
Total	20	100.00
Gender		
Female	11	55.00
Male	9	45.00
Total	20	100.00
Teacher Type		
High school counselors	10	50.00
High school ag teacher	9	45.00
High school non-ag teacher	1	5.00
Total	20	100.00

needed to answer students' questions in regards to food and agriculture industry was seen in the post-survey (Table 2).

Results from the survey indicate that providing teachers and counselors with information about the food and agricultural industry and potential careers, can increase their confidence in answering student's questions while navigating career field options. Students are known to seek guidance from teachers and counselors with issues related to school matters. A study done by Roberts et al. (2010) recognized that a contributing factor to the decline of food science undergraduates include food science not readily being recognized among high school teachers and/or guidance counselors as a discipline. If these individuals are not fully prepared to answer certain questions about the field, then students may not receive the correct information or enough information when trying to determine which field of study to pursue.

Additionally, one question asked respondents to identify which career titles fit into the food and agriculture industry when given 16 options. All of the options offered can be found within the food and agriculture industry (Table 3). However, there was not a 100 % response rate for all titles. Research scientist was the only job title to be identified by all respondents as a career in the food and agriculture industry. There was a significant increase recorded (P =0.01) from pre to post-survey when identifying law enforcement as a career related to the food and agriculture field and an increase (P = 0.06) for Medical Doctor. The increase can be related to providing teachers and counselors with information about job opportunities, such as a game warden and physicians for companies in the food industry,

Table 2. Confidence of high school counselor/teachers in ability to advise students on career availability in food and agriculture industries

Frequency Variables	Pre-Survey percent n=37	Post-Survey Percent n=20	*P*-value
Wide variety[a]			1.00
Yes	100.00	100.00	
No	0.00	0.00	
Confidence[b]			0.04
Yes	52.63	80.00	
No	47.37	20.00	

[a]Question asked:"Do you think there are a wide variety of career opportunities in food and agriculture science?"

[b]Question asked: "Are you confident that you have the information needed to provide to students interested in entering a food and/or agriculture science program if they came to you with questions about opportunities in that field?"

Table 3. Percentage of high school counselor/teachers identifying potential career opportunities in the agriculture field

Careers in Agriculture[a]	Pre-survey Percent (n=37)	Post-survey Percent (n=20)	*P*-value
Research Scientist	100.00	100.00	1.00
Computer Programming	71.05	80.00	0.45
Teacher	92.11	95.00	0.67
Hospitality Manager	65.79	80.00	0.25
Medical Doctor	50.00	75.00	0.06
Accountant	71.05	85.00	0.23
Journalism	81.58	90.00	0.39
Microbiologist	92.11	95.00	0.67
Product Development	92.11	100.00	0.19
Lawyer	68.42	85.00	0.17
Public Relations	92.11	95.00	0.67
Quality Control Manager	97.37	100.00	0.46
Engineer	78.95	85.00	0.57
Law Enforcement	42.11	75.00	0.01
Academia (University)	89.47	95.00	0.47
Safety	94.74	100.00	0.29

[a]Survey statement: "Of the careers listed click all of those that can be found in the food and agriculture industry"

provided in the information packet. All other careers in the survey were identified at a higher numeric rate post-survey, compared to pre-survey.

When asked if counselors/teachers had ever received information on careers in the food and agriculture industry, 31% of the respondents answered that they had not. This is similar to the total number of respondents who did not feel confident in their ability to answer students' questions about the food and agriculture field of study. When asked where they received information relating to agriculture careers, there was an increase noted ($P = 0.024$) from pre-survey to post-survey selecting university representative as one of those individuals. This increase was likely due to a university representative from ASU providing those agriculture teachers and counselors with information about the food and agriculture industry.

One of the last questions on the survey asked respondents to select the greatest barriers for students when seeking to further their education (Table 4). Financial constraints (65%) negative perceptions of agriculture (55%) and reluctance to leave home (40%) were the top three responses. A study by Mullinix and Garcia (2006) recognized that Latinos who are associated with agriculture jobs, such as farm hands and migrant laborers, relate it to undesirable tasks and low paying work. If these underrepresented populations have misconceptions of agriculture related careers being associated with undesirable work, it is unlikely the individual will go down a career path related to food science and agriculture industry. In addition, Hegerfeld-Baker et al. (2016) found that many students feel the public has negative perception of food and agriculture careers. Lastly, when asked if the informational packet sent along in the email was informative, 95% felt it was either

Table 4. Barriers to students pursuing degrees and careers in the food science and agriculture industries identified by high school counselors/teachers

Greatest Barriers[a]	Percent of Pre-survey (n=37)	Percent of Post-survey (n=20)
Financial constraints	52.00	65.00
Reluctance to leave home	36.84	40.00
Lack of career opportunities	21.05	20.00
Negative perception of agriculture	57.89	55.00
Other	10.52	15.00

[a]Question asked: "Given the options listed, what do you believe creates the greatest barriers to students pursing degrees and ultimately careers in the food and agriculture industries?(Select all that apply)"

informative or very informative. This indicates that after providing agriculture teachers and counselors with information on the food and agriculture industry, many of them had a positive perception of the information provided.

The results from this survey indicate the informational packet distributed to agriculture teachers and counselors had a positive effect on their post-survey responses. Moreover, the response to certain questions shows that by providing these instructors with information on careers in the food science and agriculture industry, teacher confidence level on knowledge of careers/opportunities in food science and agriculture increased. This will be beneficial to students as well, who seek information from these individuals.

High School Outreach Program

From the outreach program, a total of 1,101 surveys were collected. Of those 1,101 surveys collected, 455 of the surveys were pre-surveys and the remaining 646 surveys were post-survey. There are a larger number of post-surveys because one of the largest outreach events only received the post-surveys due to time constraints of the event. Both male and female genders were well represented with 52.27% being female and 47.73% being male (Table 5). The three top ethnicities who completed the survey were White (Not Hispanic) (60.60%), Hispanic or Latino (33.91%) and Black or African American (3.14%). When asked for their academic classification, 26.78 % answered freshman, 20.54% answered sophomore, 23.25% answered junior 28.66% answered senior in high school. The wide demographic of students represented in this survey is very beneficial to understanding influential factors among many underrepresented students within this group.

Table 5. Demographic characteristics of study participants who participated in an agriculture career high school outreach program

Demographic Characteristics	Frequency (n=646)	Percent of Total Respondents
Ethnicity[a]		
Asian	3	0.47
Black/ African American	20	3.14
Hispanic or Latino	216	33.91
Native American/ Alaskan	0	00.00
Other	10	1.57
Pacific Islander	2	0.31
White (Not Hispanic)	386	60.60
Gender[b]		
Female	335	52.27
Male	306	47.73
Classification[c]		
Freshman	173	27.55
Sophomore	129	20.54
Junior	146	23.25
Senior	180	28.66

[a]Ethnicity had a missing frequency of 5

[b]Gender had a missing frequency of 9

[c]Classification had a missing frequency of 18

When asked on a scale from one to ten (one being not likely at all and ten being extremely likely) how likely they were to pursue a career in the food and agriculture industry, there was a significant increase ($P < 0.001$) from pre-survey responses to post survey (Table 6). This indicates that providing students with information on career opportunities in agriculture and associated degree programs available at the university can positively influence student's decision on pursuing a career in food science and agriculture. Following that question, students were asked on a scale from one to ten (one being not a wide variety at all and ten being an extreme variety) if they believed there are a wide variety of careers in the agriculture industry. There was an increase of the LS means from pre survey of 7.68 to 8.15 on the post survey ($P < 0.001$). When asked on a scale from one to ten (one being not confident at all and ten being extremely confident) about their confidence level with information related to agriculture careers, there was an increase ($P < 0.001$) noted from pre-survey response to post-survey responses with LS means estimate of 5.47 to 6.27, respectively. These numbers suggest that the presentation had a positive effect on students' understanding of careers in the food science and agriculture industry. A study from Mullinux et al. (2006) found similar results with an increase of 32% interest in agriculture careers after given additional information in regards to working in the agriculture field.

Students were asked to identify what job titles fell into the food and agriculture industry when given 16 career title options (Table 7). The top three career titles selected on post-survey responses were Research Scientist (84.21%), Safety (78.79%), and Product Development (78.64%). The lowest selected option on post-survey responses was lawyer (42%). Even though all the job titles given can be selected as careers found in the food and

Table 6. Perception of career opportunities and likelihood of students to pursue a career in agriculture before and after participating in career outreach event (n=646)

Frequency variables	Estimate	Standard Error	*P*-Value
Wide variety[a]			<.0001
Pre-Survey	7.68	0.16	
Post Survey	8.15	0.17	
Likelihood to pursue[b]			<.0001
Pre-Survey	4.61	0.20	
Post Survey	5.51	0.21	
Confidence[c]			<.0001
Pre-Survey	5.47	0.18	
Post Survey	6.27	0.19	

[a]Question asked on a scale: "Do you think there are a wide variety of career opportunities in food and agriculture science?" Scale: 1-no careers to 10-many careers

[b]Question asked on a scale: "How likely are you to pursue a degree in food and agriculture?" Scale: 1-not likely to 10-very likely

[c]Question asked on are scale: "Are you confident that you have the information needed to enter a food and/or agriculture science program if you chose to?" Scale: 1-not confident to 10-very confident

Table 7. Potential career opportunities in the agriculture field identified by student respondents who participated in a agriculture career high school outreach program

Careers in Agriculture[a]	Pre-survey Percent (n=455)	Post-survey Percent (n=646)	*P*-Value
Research Scientist	72.31	84.21	<.0001
Computer Programming	23.08	48.61	<.0001
Teacher	48.57	72.45	<.0001
Hospitality Manager	30.77	54.80	<.0001
Medical Doctor	37.36	66.72	<.0001
Accountant	23.52	48.61	<.0001
Journalism	31.65	49.07	<.0001
Microbiologist	69.45	78.48	0.0007
Product Development	66.59	78.64	<.0001
Lawyer	22.42	42.72	<.0001
Public Relations	43.74	62.38	<.0001
Quality Control Manager	50.99	69.35	<.0001
Engineer	49.89	65.94	<.0001
Law Enforcement	27.47	49.54	<.0001
Academia (University)	32.97	53.64	<.0001
Safety	57.36	78.79	<.0001

[a]Survey statement: "Of the careers listed check all of those that can be found in the food and agriculture industry"

agriculture industry, many students did not choose them all. However, there was a significant increase ($P < 0.0001$) recorded on 15 answer choices from pre-survey to post-survey. These results show that presenting students with information on the various career opportunities in agriculture and presenting to the Ag for Life Map helped increase students understanding of careers within the food and agriculture industry.

Students were asked how often they received information on the food and agriculture industry. There was a significant increase of 1.66 (out of a 10 point scale) ($P < 0.001$) noted of students who felt they had received information on agriculture from the pre-survey to the post-survey. The follow up question ask the students if they have received information, "where did you receive information on food and agriculture college degrees and/or careers". The top three responses chosen from the post survey responses included agriculture teacher (71.66%), parent or family member (48.5.%), and university representative (45.5%) (Table 8). These numbers indicated that providing students with information on career opportunities in agriculture, information on degree programs available at the university and the hands on presentation helped students understand where they can receive information on career opportunities associated with various degree programs.

Students were asked to choose the top three individuals they would seek career information from. The top three responses from the post-survey were the same as the previous question with 46% choosing agriculture teacher first followed by parent or family (23%) second, and university representative (21%) third. These responses were similar to a study done by Ferry (2006) that found family and communities are very important when it comes to shaping young adults' career choices.

Table 8. Potential sources of information regarding degrees and careers in food science and agriculture identified by respondents who participated in a high school agriculture career outreach program

Where was Information Received[a]	Post-Survey Percent (n=646)
High school counselor	28.33
High school agriculture teacher	79.10
County agent	12.69
Community	23.22
Parent/ family	42.11
Online	29.10
University representative	59.44
Other	18.27

[a]Question asked: "Where did you receive information on food and agriculture college degrees and/or careers?"

The results from this study indicate that the outreach program had a positive effect on students' perception of career opportunities in the agriculture industry. Moreover, the increase in certain questions positive response shows that by providing students with information on career opportunities in agriculture, introduction to the Ag for Life Map, and giving them information on degree programs available at the university, helped increase students' knowledge on careers/opportunities in food science and agriculture.

Leaders in Food Technology (LIFT) Summer Program

Of the students who attended the LIFT summer program, 18 completed a survey over the experience. Sixty-one percent of the respondents were female and 38.89% were male (Table 9). The majority (77%) of the students selected White (Not Hispanic) as their ethnicity. In addition, most (50%) of the students who completed the survey were in their first year of college. When asked if they were considered a first generation student, 38.89% answered yes. A majority (72%) of the students selected rural when asked if they grew up in an urban or rural setting. At 94%, most of the students who participated in the LIFT program receive or have received financial aid/or scholarship.

When students were asked if prior to the LIFT camp, they believed there were a wide variety of jobs opportunities within the food and agriculture industry the majority (55.56%) answered yes (Table 10). In addition, the majority (72.22%) answered yes when asked if prior to LIFT camp had they ever considered a career in the food and agriculture industry. Lastly, students were asked if they had ever received information on career opportunities in the food and agriculture industry; and 55% percent of the students answered yes. This

Table 9. Demographic characteristics of study participants of students who participated in the LIFT summer program

Demographic Characteristics	Frequency (n=18)	Percent of Respondents
Ethnicity		
Black/ African American	1	05.56
Hispanic or Latino	2	11.11
Pacific Islander	1	5.56
White (Not Hispanic)	14	77.78
Gender		
Female	11	61.11
Male	7	38.89
Classification		
Freshman	9	50.00
Sophomore	3	16.67
Junior	3	16.67
Senior	3	16.67
First Generation[a]		
Yes	7	38.89
No	11	61.11
Living Demographic[b]		
Urban	5	27.78
Rural	13	72.22
Received scholarship/financial aid		
Yes	17	94.44
No	1	5.56

[a] First generation is defined as a student whose parent(s) or guardian(s) have not completed a bachelor's degree

[b]Urban setting, for this study, is defined as an area of 50,000 people or more. Rural is defined as populations less than 50,000.

Table 10. Perception of career opportunities and likelihood of students to pursue a career in agriculture of students participating in the LIFT summer program

Frequency Variables	Frequency (n=18)	Percent of Respondents
Wide variety[a]		
Yes	10	55.56
No	8	44.44
Considered career[b]		
Yes	13	72.22
No	5	27.78
Received infromation[c]		
Yes	10	55.56
No	8	44.44

[a]Question asked:" Prior to the LIFT camp, did you think there were a wide variety of job opportunities within the food and agriculture industry?"

[b]Question asked: "Prior to the LIFT camp, have you ever considered a career in the food and agriculture industry?"

[c]Question asked: "Prior to LIFT camp, have you ever received information on career opportunities in the food and agriculture industry?"

indicated that although the LIFT program may have helped students' gain additional knowledge of the food science and agriculture field, many students had already decided to follow a career path in this field. This was expected as all participants were pursuing a degree within the agriculture field.

Similar to the first two components of this project, respondents were asked to identify what careers were associated with agriculture when given 16 career options (Table 11). All of the career options can be found within the food science and agriculture industry. However there was not a 100 % response rate for any titles. The top three responses from the LIFT participants were Research Scientist (94.44%), Safety (94.44%), and Product Development (88.89%).

Students involved in the LIFT program were allowed to move onto campus a week before the semester began. When asked if moving in early was beneficial to them (on a scale of one-not being beneficial at all to ten-being very beneficial) the mean was 8.53. Additionally, students were asked to rank the top three events associated with LIFT which they felt benefited them the most. The top three events chosen were interacting with University Recreation (UREC) presentation (100%), interacting with ASU students and graduate students (72.22%), and interacting with agriculture department faculty and staff (77.78%) (Table 12).

A study done by Hegerfeld-Baker et al. (2016) also found the relationship between student and agriculture instructor to be important to a student when choosing a career path. In addition, 40% of the students in the current study identified the product development activity where they made jerky as the most enjoyable activity of the camp. Students were asked to

Table 11. Potential career opportunities in the agriculture field identified by respondents who participated in the LIFT summer program

Careers in Agriculture[a]	Frequency (n=18)	Percent of Respondents
Research Scientist	17	94.44
Computer Programming	10	55.56
Teacher	14	77.78
Hospitality Manager	7	38.89
Medical Doctor	6	33.33
Accountant	11	61.11
Journalism	7	38.89
Microbiologist	15	83.33
Product Development	16	88.89
Lawyer	9	50.00
Public Relations	13	72.22
Quality Control Manager	15	83.33
Engineer	12	66.67
Law Enforcement	7	38.89
Academia (University)	11	61.11
Safety	17	94.44

[a]Survey statement: "Of the careers listed check all of those that you believe can be found in the food and agriculture industry"

Table 12. Beneficial LIFT events identified by student participants

Events[a]	Frequency (n=18)	Percent of Respondents
Career Development	6	33.33
Leadership building	5	27.78
University Recreation Presentation	18	100.0
Interacting with LIFT Peers	10	55.56
Student Life Resources	1	05.56
Interacting with ASU students and Graduate students	13	72.22
Food Production	6	33.33
Interacting with faculty	14	77.78
Campus orientation	7	38.89

[a]Question asked: "Which THREE events during LIFT camp do you feel prepared you the most for your freshman year of college?"

rank (on a scale from one to ten, one being not informative at all and 10 being extremely informative) how informative the program was to them. The mean was 8.53 with a standard deviation of 1.54. Students were also asked for recommendations on how to make the program more successful. Multiple respondents answered with more advertisement of the program to students who qualify. Many of the responses received seemed to indicate that the program was beneficial for all those who attended. Furthermore, students who added the program seemed to have a good understanding of the food science and agriculture industry after the program. For future research a pre-survey and post-survey to measure the increase or decrease in responses would be beneficial. Additionally, results from this survey can help with future LIFT programs, as well as recruitment of students into the food science and agriculture field.

ASU Student Campus Survey

The ASU campus survey questions focused on understanding contributing factors students come across when deciding a field of study. A total of 519 surveys were submitted for analysis using Qualtrics. However, of the 519 survey submitted only 511 could be analyzed because they were provided by students who were 18 years of age or older. With this survey there was a wide range of demographic characteristics within the responses submitted (Table 13). Of the surveys analyzed, 70.43% of the respondents were female and 29.57% were male. The three largest ethnic populations that responded to the survey were White (Not Hispanic) (61.40%), Hispanic (28.75%) and African American (4.93%). The most common student ethnicities of ASU students in the Fall semester of 2017 consisted of 53% White (Not Hispanic), 32.5% Hispanic, and 6.25% African American (ASU, 2017-

Table 13. Demographic characteristics of ASU students completing degree choice questionnaire Fall of 2017

Demographic Characteristics	Frequency (n=511)	Percent of Respondents
Ethnicity		
Black/ African American	24	4.93
Asian	10	2.05
Hispanic or Latino	140	28.75
Native American	3	0.62
Other	10	2.05
Pacific Islander	1	0.21
White (Not Hispanic)	299	61.40
Gender		
Female	343	70.43
Male	144	29.57
Classification		
Freshman in college	118	24.28
Sophomore in college	57	11.73
Junior in college	100	20.58
Senior in college	111	22.84
Graduate student	97	19.96
Other	3	0.62
First Generation[a]		
Yes	252	51.75
No	235	48.25
Living Demographic[b]		
Urban	219	44.97
Rural	268	55.03
Received scholorship/financial aid		
Yes	352	72.28
No	135	27.72
College of study		
Archer College of Health and Human Services	110	23.35
College of Arts and Humanities	71	15.07
College of Business	55	11.68
College of Education	68	14.44
College of Science and Engineering	144	30.57
Undecided	23	4.88

[a]First generation is defined as a student whose parent(s) or guardian(s) have not completed a bachelor's degree

[b]Urban setting, for this study, is defined as an area of 50,000 people or more. Rural will be considered as populations less than 50,000.)

2018). The top three responses for what college of study respondents belongs to were College of Science and Engineering (30.57%), Archer College of Health and Human Services (23.35%) and College of Education (14.44%). Only 4.88% selected undecided. Urban demographic characteristics, for this study, were defined as an area of 50,000 people or more and rural considered a population less than 50,000. Of the responses, 55.03% of the students grew up in rural area and 44.97% of the students grew up in an urban setting. Another demographic characteristic that was analyzed was first generation students. First generation students were defined as a student whose parent(s) or guardian(s) have not completed a bachelor's degree. Of the 511 surveyed, 48.25% students were recorded to be a part of the first generation population of students at ASU.

One area of focus of this survey was evaluating potential influential factors students may come across when deciding on a field of study or career path. Variables evaluated consisted of financial constraints, family/friend relationships, distance to the university, and work experience within agriculture (Table 14). One of the first questions asked on the survey focused on identifying when students decided to further their education after high school; 71.88% of students said after their freshman year of high school. The second largest group that answered yes (11.21%) responded to sometime after their junior year in high school when they decided. Students were asked to identify the top three contributing factors for them when choosing ASU over other universities. The top three responses chosen were affordability (74.69%), distance from home (50%) and academic opportunities (36.83%). The majority of students (68.88%) indicated that availability of scholarship was a contributing factor when enrolling in a specific academic college, making two of the three most

Table 14. Potential influential factors for students choosing to further their education identified by students attending ASU Fall 2017 semester, (n=519)

Survey Variables	Frequency	Percent of Respondents
Predictor Variables[a]		
Affordability	363	74.69
Family/friend	105	21.60
Distance from home	243	50.00
Quality of faculty	92	18.00
Academic reputation	154	31.69
Extracurricular opportunities	71	14.61
Academic opportunities	179	36.83
Extracurricular Activities[b]		
4-H	91	21.21
FFA	129	30.00
Boys/girls scouts	55	12.00
Athletics	251	58.37
Theater/speech	87	20.23
Music/dance	111	25.81
Debate	32	7.46
Honor society	223	51.86
Special interest groups	66	15.35
Culinary arts	23	5.35
Boys and girls Club	5	1.16
Vocational training	15	3.49
Other	144	33.49
Relationships[c]		
Parent	269	59.12
Friend	155	34.07
Relative	127	27.91
High school teacher	140	30.77
High school counselor	54	11.87
College professor	88	19.34
Employer	53	11.65
Other	120	26.37

[a]Question asked: "Of the following which would you rate as the three most influential factors which impacted you in choosing ASU over other universities?" (with 1being the most influential)

[b]Question asked: "Were you active in any of the following?" (check all that you were involved in)

[c]Question asked: "Did any of the following individuals influence your decision in choosing your major?" (Check all that apply)

commonly identified contributing factors financial in nature. The other contributing factor identified that deals with finances was future financial gain. When asked if promotion in career choice was a contributing factor, 53% answered yes. The top two choices for contributing factors of choosing a major was passion for career (72.50%) and enjoyment of career (62.71%) (Table 15). Hegerfeld-Baker et al. (2015) found similar results with the odds ratio of passion/job satisfaction being 1.50 ($P < 0.01$) when choosing a STEM major.

One question, in particular focused on how influential parents/guardians opinions are on students entering a certain field of study or career path. When asked, "Has your family ever discouraged you from entering a certain career path?" 31 % of total respondents answered yes. Of those who selected yes, 41.05% were Hispanic, 38.95% were White (Not Hispanic) and 12.63% were African American. No significant difference ($P > 0.05$) was noticed between female and male responses relating to relationships being a contributing factor to influencing student's decision when deciding to further their education. When asked about influential individuals when deciding on a major, 59.12% identified parents as their influential individual.

Another contributing factor that was evaluated was distance from home. As stated above, 50% of the respondents agreed that distance was a top contributing factor when deciding on a university at which to further their education (Table 14). Of those Hispanic respondents, 50% indicated distance from home being a factor when choosing a university. This was higher than any other ethnicity. Lastly, another contributing factor looked at was the misunderstanding or lack of information about the food and agriculture industry. Students

Table 15. Influential factors of students pursuing a specific major, identified by students attending ASU Fall 2017 semester

Influential Factors[a]	Frequency (n=511)	Percent of Respondents
Researched potential career	148	30.83
Financial gain of career	183	38.13
Job security	205	42.71
Career of family	117	24.38
Passion for career	348	72.50
Enjoyment of career	301	62.71
Career goals	207	43.13
Other	42	08.75

[a]Question asked: "Did any of the following factors influence you when deciding choosing your major?"

were asked if they knew what was meant by the term “agriculture industry”, and 82% stated yes (Table 16).

In addition, 90% of students agreed that there was an abundance of job opportunities within the food and agriculture industry. However, 68.66% of students said no when asked if they had ever considered a career in the food and agriculture industry. This could be related to lack of experience with food and agriculture industry. Additionally, over 55% of students answered no to ever receiving information about food and agriculture careers. Of those who selected Hispanic as ethnicity, 23.02% of the respondents indicated they would consider a career in agriculture. In addition, 60.43% of respondents who selected Hispanic as ethnicity said they have never received information on careers in food science and agriculture. The results from this study can help with recruiting of students into the food science and agriculture field of study. Results from the previous outreach survey indicate there is an increase in interest when presented information on the major/career field. ASU can use this to justify sending information out to students and potential recruit undeclared students into the food and agriculture sciences. Additionally, ASU as a whole can use results on influential factors to shape effective recruitment programs for ASU as a whole.

The lack of information given to students about career opportunities in agriculture could explain the decision of choosing not to further their education within those degree fields. For future research, researchers should email students across campus containing a pre-survey, informational packet, and a post survey. This might help improve the lack of knowledge among students in regards to agriculture careers.

Table 16. Perception of career opportunities and likelihood of students to pursue a career in agriculture identified by students attending ASU Fall 2017semester,

Frequency Variables	Frequency (n=511)	Percent of Respondents
Understand the term Agriculture[a]		
Yes	398	82.23
No	86	17.77
Wide variety of careers[b]		
Yes	435	89.69
No	50	10.31
Considered career in Agriculture[c]		
Yes	152	31.34
No	333	68.66
Received information[d]		
Yes	216	44.54
No	269	55.46

[a]Question asked: "Do you know what the term Agriculture industry refers to?"

[b]Question asked: "Do you think there are a wide variety of job opportunities in the food and agriculture industry?"

[c]Question asked: "Have you considered a career in the food and agriculture industry?"

[d]Question asked: "Have you ever received information relating to food and agriculture careers?"

CONCLUSION

Information gathered from the four different focus groups of this study provided insight into identifying influential factors students/underrepresented students may have when choosing a degree path related to food science and agriculture. Three of the four focus groups (high school counselors/teachers, LIFT and high school outreach program) dealt with students who already have been exposed to agriculture. The other group (ASU students) had a wider variety of respondents in terms of agriculture background. Additionally, all evaluations of the focus groups were survey based; therefore, the data recorded described their perceptions and not necessarily actual behavior of the respondents.

Survey results of teachers and counselors indicated distribution of an informational packet had a positive effect on post survey responses. More specifically, the increase in positive responses of questions, like teachers' confidence level, displayed that providing these instructors with information on careers in the food science and agriculture industry was beneficial to improving their knowledge on careers/opportunities in food science and agriculture. The main influential factors identified in this survey included financial reasoning, negative perception of agriculture and reluctance to leave home. Overall, ASU can use results from this study to justify future distribution of informational packets to counselors/agriculture teachers to help with information regarding the agriculture industry and financial aid when students come to inquire.

The results from the outreach program also displayed a positive outcome when information on food science and agriculture was provided to respondents. Information on

food science and agriculture industry seemed to be an influential factor on responses. The increase in students indicating potentially pursuing a career in agriculture after participating in an outreach event identified the event as a success. Similar outreach events can be incorporated into many high schools and could potentially increase the number of students choosing a degree/ career in food science and agriculture. These outreach events could help identify student participants for campus events like LIFT. The LIFT summer program helped students become acclimated to campus living prior to the start of their first semester in college, in addition to introducing them to degree and career opportunities. Furthermore, overall financial aid was an influential factor identified in the LIFT survey, and results can help aid in universities presenting more information on financial aid to prospective students.

Lastly, the results from the ASU survey indicate that the lack of information given to students about careers in food science and agriculture could impact the decision making processing of choosing not to further their education with those degree fields. Results revealed some influential factors recruiters can take into account when recruiting students into the food science and agriculture field and to the ASU campus as a whole. In general influential factors from this survey seemed to follow results from other surveys as they were distance from home, parents being influential to them when deciding on a major and financial reasoning. Results from this study can justify future distribution of information on the food science and agriculture industry as well as financial resource information. This will aid in the lack of knowledge students and parents may have, as well as potentially improve recruitment of students who are still undecided in their first couple of years of school.

Overall, this research study had a positive impact on accomplishing the original objectives. Results will help with future recruitment efforts by helping recruiters understand influential factors for underrepresented populations. By providing information to these underrepresented populations, there may be a further increase in confidence and likelihood of future students to pursue a career in agriculture. Information provided on a certain field or career will also increase knowledge of individuals to utilize when making decisions on field of study and career choices. Distribution of information to students and their guardians will allow families to have a better understanding of the agriculture industry as a whole when students express interest in the fields of study. Moreover, information provided on financial aid, as a whole, can influence students' pursuit in furthering their education at the university level.

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APPENDICES

APPENDIX A

IRB APPROVAL FORMS

ANGELO STATE UNIVERSITY
College of Graduate Studies
Institutional Review Board

09/25/2017

Dr. Loree Branham
Dept. of Agriculture
Angelo State University
San Angelo, TX 76909

Dear Loree:

Your proposed project titled, "*Developing Tomorrow's Meat and Food Scientist*" was reviewed by Angelo State University's Institutional Review Board for the Protection of Human Research Subjects in accordance with federal regulations 45 CFR 46 for expedited review and was APPROVED under Category F.7 of 63 FR 60364-60367.

This protocol is approved for one year effective September 25, 2017, and it expires one year from this date. If the study will continue beyond one year, you must submit a request for continuation before the current protocol expires.

The protocol number for your approved project is #BRA-092517. Please include this number in the subject line of in all future communications with the IRB regarding the protocol.

Sincerely,

Teresa Hack, Ph.D.
Chair, Institutional Review Board

Dr. Teresa Hack, IRB Chair | ASU Station #11025 | San Angelo, Texas 76909
Phone: (325) 486-6121 | Fax: (325) 942-2194

ANGELO STATE UNIVERSITY
College of Graduate Studies
Institutional Review Board

8/3/2017

Dr. Loree Branham
Dept. of Agriculture
Angelo State University
San Angelo, TX 76909

Dear Loree:

The proposed project submitted by your student Savina Robles titled, "*Identification of Factors Influencing Underrepresented Students Choosing Food Science Related Degrees in College*" has been approved in accordance with federal regulations 45 CTR 46.

The approval is effective beginning August 3, 2017. Please be aware that the protocol will expire one year from its original approval date. If the study will continue beyond that date, you must submit a request for continuation before the current protocol expires.

The approved addendum is for protocol #BRA-080317. Please include this number in the subject line of in all future communications with the IRB regarding the protocol.

Sincerely,

Teresa (Toy) Hack, Ph.D.
Chair, Institutional Review Board

Dr. Teresa Hack, IRB Chair | ASU Station #11025 | San Angelo, Texas 76909
Phone: (325) 486-6121 | Fax: (325) 942-2184

APPENDIX B

HIGH SCHOOL COUNSELORS/AGRICULTURE TEACHER SURVEY

PRE AND POST-SURVEY

TEACHER PRE-SURVEY

- What is your gender?
    - Male
    - Female
- What ethnicity do you closely identify as?
    - White (Not Hispanic)
    - Black or African American
    - American Indian or Alaska Native
    - Asian
    - Native Hawaiian or Pacific Islander
    - Hispanic or Latino
    - Other
- What is your title as an instructor?
    - H.S. counselor
    - H.S. Ag-Teacher
    - M.S. Ag-Teacher
    - Teacher
    - County Agent
- Do you think there are a wide variety of career opportunities in food and agriculture science?
    - Yes
    - No
- Are you confident that you have the information needed to provide to students interested in entering a food and/or agriculture science program if they came to you with questions about opportunities in that field?
    - Yes
    - No
- Of the careers listed click all of those that can be found in the food and agriculture industry.
    - Research scientist
    - Computer programming
    - Teacher
    - Hospitality manager
    - Medical doctor
    - Accountant
    - Journalism
    - Microbiologist
    - Product development

    - Lawyer
    - Public relations
    - Quality control manager
    - Engineer
    - Law enforcement
    - Academia (University)
    - Safety
- Have you ever received information on food and agriculture college degrees and/or careers?
    - Yes
    - No
- Where did you receive the information mentioned in above? (Check all that apply)
    - H.S. counselor
    - Ag-teacher
    - County agents
    - Community
    - Parent/family
    - On-line
    - University representative
    - Other
- Given the options listed, which create the greatest barriers to students pursing degrees and ultimately careers in the food and agriculture industries? (click all that apply)
    - Financial constraints
    - Reluctance to leave home
    - Lack of career opportunities
    - Negative perception of agriculture
    - Other

TEACHER POST-SURVEY

- What is your gender?
    - Male
    - Female
- What ethnicity do you closely identify as?
    - White (Not Hispanic)
    - Black or African American
    - American Indian or Alaska Native
    - Asian
    - Native Hawaiian or Pacific Islander
    - Hispanic or Latino
    - Other
- What is your title as an instructor?
    - H.S. counselor
    - H.S. Ag-Teacher
    - M.S. Ag-Teacher
    - Teacher
    - County Agent
- Do you think there are a wide variety of career opportunities in food and agriculture science?
    - Yes
    - No
- Are you confident that you have the information needed to provide to students interested in entering a food and/or agriculture science program if they came to you with questions about opportunities in that field?
    - Yes
    - No
- Of the careers listed click all of those that can be found in the food and agriculture industry.
    - Research scientist
    - Computer programming
    - Teacher
    - Hospitality manager
    - Medical doctor
    - Accountant
    - Journalism
    - Microbiologist
    - Product development

    - Lawyer
    - Public relations
    - Quality control manager
    - Engineer
    - Law enforcement
    - Academia (University)
    - Safety
- Where did you receive the information mentioned in question 5? (Check all that apply)
    - H.S. counselor
    - Ag-teacher
    - County agents
    - Community
    - Parent/family
    - On-line
    - University representative
    - Other
- Given the options listed, what do you believe create the greatest barriers to students pursuing degrees and ultimately careers in the food and agriculture industries? (Click all that apply)
    - Financial constraints
    - Reluctance to leave home
    - Lack of career opportunities
    - Negative perception of agriculture
    - Other
- How informative was the information packet?
    - Very informative
    - Informative
    - Neutral
    - Not very informative
    - Not at all

APPENDIX C

HIGH SCHOOL OUTREACH PREOGRAM SURVEY

PRE AND POST-SURVEY

OUTREACH STUDENT PRE-SURVEY

Please circle the appropriate response **Student: PRE - SURVEY**

Gender: **Male** **Female**

Ethnicity: **White (Not Hispanic)** **Black or African American** **Hispanic or Latino** **Asian** **Pacific Islander** **Native American or Alaska Native** **Other**

Classification: **Freshman** **Sophomore** **Junior** **Senior**

Answer the following questions on a scale of 1 – 10.

1. How likely are you to pursue a degree in food and agriculture science?

Not Likely **Very Likely**

1 2 3 4 5 6 7 8 9 10

2. Do you think there are a wide variety of career opportunities in food and agriculture science?

No Careers **Many Careers**

1 2 3 4 5 6 7 8 9 10

3. Are you confident that you have the information needed to enter a food and/or agriculture science program if you chose to?

Not Confident **Very Confident**

1 2 3 4 5 6 7 8 9 10

4. Of the careers listed check all of those that can be found in the food and agriculture industry.

	Research Scientist		Product Development
	Computer Programming		Lawyer
	Teacher		Public Relations
	Hospitality Manager		Quality Control Manager
	Medical Doctor		Engineer
	Accountant		Law Enforcement
	Journalism		Academia (University)
	Microbiologist		Safety

5. Have you ever received information on food and agriculture college degrees and/or careers?

Not at all **Routinely**

1 2 3 4 5 6 7 8 9 10

6. Where did you receive the information mentioned in question 5? (Check all that apply)

	H.S. Counselor		Parent/ Family
	Ag-Teacher		On-line
	County Agents		University Rep.
	Community		Other

7. Of the individuals listed rank the top three that you are most likely to seek career information from with number 1 being the most likely.

Rank		Rank	
	H.S. Counselor		Parent/ Family
	Ag-Teacher		On-line
	County Agents		University Rep.
	Community		Other

OUTREACH STUDENT POST-SURVEY

Please circle the appropriate response **Student: POST - SURVEY**

Gender: **Male** **Female**

Ethnicity: **White (Not Hispanic)** **Black or African American** **Hispanic or Latino** **Asian** **Pacific Islander** **Native American or Alaska Native** **Other**

Classification: **Freshman** **Sophomore** **Junior** **Senior**

Answer the following questions on a scale of 1 – 10.

1. How likely are you to pursue a degree in food and agriculture science?

Not Likely **Very Likely**

1 2 3 4 5 6 7 8 9 10

2. Do you think there are a wide variety of career opportunities in food and agriculture science?

No Careers **Many Careers**

1 2 3 4 5 6 7 8 9 10

3. Are you confident that you have the information needed to enter a food and/or agriculture science program if you chose to?

Not Confident **Very Confident**

1 2 3 4 5 6 7 8 9 10

4. Of the careers listed check all of those that can be found in the food and agriculture industry.

	Research Scientist		Product Development
	Computer Programming		Lawyer
	Teacher		Public Relations
	Hospitality Manager		Quality Control Manager
	Medical Doctor		Engineer
	Accountant		Law Enforcement
	Journalism		Academia (University)
	Microbiologist		Safety

5. Have you ever received information on food and agriculture college degrees and/or careers?

Not at all **Routinely**

1 2 3 4 5 6 7 8 9 10

6. Where did you receive the information mentioned in question 5? (Check all that apply)

	H.S. Counselor		Parent/Family
	Ag-Teacher		On-line
	County Agents		University Rep.
	Community		Other

7. Of the individuals listed rank the top three that you are most likely to seek career information from with number 1 being the most likely.

Rank		Rank	
	H.S. Counselor		Parent/Family
	Ag-Teacher		On-line
	County Agents		University Rep.
	Community		Other

8. How informative was this presentation for you?

Not at All **Very**

1 2 3 4 5 6 7 8 9 10

9. Will the information provided assist you in making decisions about your future?

Not at All **Very**

1 2 3 4 5 6 7 8 9 10

APPENDIX D

LEADERS IN FOOD TECHNOLOGY (LIFT) SUMMER PROGRAM SURVEY

LIFT SURVEY

- What is your gender?
    - Male
    - Female
- What ethnicity do you most closely identify with?
    - White (Not Hispanic)
    - Hispanic or Latino
    - African American
    - Asian
    - Native American
    - Pacific Islander
    - Other
- What is your academic classification?
    - Freshman
    - Sophomore
    - Junior
    - Senior
- Are you a first generation college student? First generation is defined as a student whose parent(s) or guardian(s) have not completed a bachelor's degree
    - Yes
    - No
- Did you grow up in an urban setting or rural? (Urban setting, for this study, is defined as an area of 50,000 people or more. Rural will be considered as populations less than 50,000.)
    - Urban
    - Rural
- Do you or have you ever received any financial aid/or scholarship?
    - Yes
    - No
- Prior to the LIFT camp, have you ever considered a career in the food and agriculture industry?
    - Yes
    - No
- Prior to the LIFT camp, did you think there were a wide variety of job opportunities within the food and agriculture industry?
    - Yes
    - No

- Prior to LIFT camp, have you ever received information on career opportunities in the food and agriculture industry?
    - Yes
    - No
- If you answered yes to the previous question, where did you receive the information mentioned above?
    - High School Counselor
    - Parent/Family
    - Ag Teacher
    - On-line
    - County Agent
    - University Representative
    - Community
    - Other
- Of the individuals listed, which TOP THREE are you most likely to seek career information from.
    - High School Counselor
    - Parent/Family
    - Ag Teacher
    - On-line
    - County Agent
    - University Representative
    - Community
    - Other
- Of the careers listed, check all of those that you believe can be found in the food and agriculture industry.
    - Research scientist
    - Product development
    - Computer programming
    - Lawyer
    - Teacher
    - Public relations
    - Hospitality manager
    - Quality control manager
    - Medical doctor
    - Engineer
    - Accountant
    - Law enforcement
    - Journalism

- Academia (University)
- Microbiologist
- Safety

- On a scale from 0 to 10, how beneficial was early move in for LIFT camp to the start of your college career?

	Not beneficial at all										Incredibility beneficial
Beneficial scale	0	1	2	3	4	5	6	7	8	9	10

- Which THREE events during LIFT camp do you feel prepared you the most for your freshman year of college?
  - Career Development: Resume building
  - Leadership building activities/ guest speakers
  - UREC presentation
  - Interacting with LIFT peers
  - Student Life/Resources presentation
  - Interacting with ASU students and grad students
  - Food production activities at the meat lab
  - Interacting with Ag faculty and staff
  - Campus orientation (learning locations on campus)

- Which LIFT event did you enjoy the most?

  - Bowling social
  - Product Development: Jerky and Dried sausage
  - Product Development: Ice cream
  - Product Development: Cheese making
  - Leadership Activity
- After LIFT camp, are you confident you have the information needed when considering entering a career in the food and agriculture industry?

	Not confident at all										Extremely
Confidence scale	0	1	2	3	4	5	6	7	8	9	10

- How informative was the LIFT program?

	Not informative at all										Extremely
Informative Scale	0	1	2	3	4	5	6	7	8	9	10

How helpful was the information provided during LIFT camp when deciding on your career goals and aspirations?

	Not helpful at all										Extremely helpful
Helpful Scale	0	1	2	3	4	5	6	7	8	9	10

APPENDIX E

ASU STUDENT CAMPUS SURVEY

ASU STUDENT CAMPUS SURVEY

College freshman Survey Questions-

- Are you at least 18 years or older?
    - Yes
    - No

If the student answers 'No' to the previous question the survey will automatically be completed with the following statement.

Thank you for your time and input!

If you would like more information on careers in food and agriculture please email Dr. Branham in the Agriculture Department at Angelo State University. Email: Loree.branham@angelo.edu

- What is your gender?
    - Male
    - Female
    - Choose not to respond
- What ethnicity do you closely identify as?
    - White (Not Hispanic)
    - Hispanic or Latino
    - African American
    - Asian
    - Native American
    - Pacific Islander
    - Other: _____
- What is your classification?
    - Freshman in college
    - Sophomore in college
    - Junior in college
    - Senior in college
    - Graduate Student
    - Other: _____
- Are you a first generation college student? First generation is defined as a student whose parent(s) or guardian(s) have not completed a bachelor's degree.
    - Yes
    - No

- Did you grow up in an urban setting or rural? (Urban setting, for this study, is defined as an area of 50,000 people or more. Rural will be considered populations less than 50,000.)
    - Rural
    - Urban
- What number is closest to your graduating class size?
    - Homeschooled
    - <50
    - 50-100
    - 101-200
    - 201-400
    - 401-600
    - 601-800
    - Over 800
- When did you decide to further your education after high school?
    - Freshman year of high school
    - Sophomore year of high school
    - Junior year of high school
    - Senior year of high school
- When did you decide on your field of study?
    - Freshman year of high school
    - Sophomore year of high school
    - Junior year of high school
    - Senior year of high school
    - Freshman year of college
    - Sophomore year of college
    - Other: _____
- Was a financial aid / scholarship opportunity a factor in choosing to further your education at the university level?
    - Yes
    - No
- Of the following which would you rate as the three most influential factors which impacted you in choosing ASU over other universities? (with 1being the most influential)
    - Affordability
    - Friend or family member is a student or alumni
    - Distance from home
    - Scholarship opportunity

    - Quality of faculty
    - Academic reputation/quality of ASU
    - Opportunities to participate on teams or groups (ie. Athletics, band/ theater, judging teams, etc.)
    - Academic opportunities (It has a good program in the field I want to study)
- Did you ever attend an event where ASU had a recruiter present?
    - Yes
    - No
- What field of study closely relates to the career path you would like to follow?
    - Accounting, Economics, and Finance
    - Agriculture (Including Agribusiness, Meat and Food Science, Wildlife and Range, Animal Science, Ag Science and Leadership)
    - Applied Arts and Sciences
    - Art, Studio and Music
    - Biology
    - Border and Homeland Security
    - Border Security
    - Chemistry
    - Civil Engineering
    - Communications, Drama and Journalism
    - Computer Science
    - Criminal Science
    - Engineering
    - English
    - Finance
    - Geoscience
    - Government
    - History
    - Health Science Professions
    - Interdisciplinary Studies
    - International business
    - Kinesiology
    - Liberal Arts
    - Management and Marketing
    - Mass Media
    - Mathematics
    - Modern Languages
    - Nursing
    - Philosophy

    - Physical Therapy
    - Psychology, Sociology, and Social Work
    - Physics
    - Teacher Education
    - Other:_____
    -
- What college of study do you belong to?
    - Archer College of Health and Human Services
    - College of Arts and Humanities
    - College of Business
    - College of Education
    - College of Science and Engineering
    - Undecided
- Did you ever change your major after selecting it for the first time on Apply Texas?
    - Yes
    - No
- How many times have you changed you major?
    - 0
    - 1
    - 2
    - 3
    - 4 or more
- If you have changed your major, when was the last time you changed it?
    - Never changed my major
    - Before my freshman year officially started.
    - During my Freshman year of college
    - During my Sophomore year of college
    - During my Junior year of college
    - During my Senior year of college
- Did information on job benefits help you in making a career choice?
    - Yes
    - No
- Did information on opportunities of promotion in your career field influence you decision making when choosing a career/ field of study?
    - Yes
    - No
- Are flexible work hours a contributing factor when deciding your career/ field of study?

    - Yes
    - No
- Did travel opportunities in your career field influence your decision making when choosing your career field/ field of study?
    - Yes
    - No

- Were you active in any of the following? (check all that you were involved in)
    - 4-H
    - FFA
    - Boy/ Girl Scouting
    - Athletics
    - Theater/ Speech
    - Music/ Dance
    - Debate
    - Honor Society
    - Special interest groups
    - Culinary arts
    - Boys and Girls Club
    - Vocational training clubs
    - Other:_____
- Did any of the following individuals influence your decision in choosing your major? (Check all that apply)
    - Parents
    - Friends
    - Relative
    - High school teacher
    - High school counselor
    - College professor
    - Employer
    - Other:_____
- Did any of the following factors influence you when deciding choosing your major? (Check all that apply)
    - Researched potential career path
    - Financial gain of career
    - Job security of career
    - Career of family member or friend

    - Passion for career
    - Enjoyment of career
    - Career goals
    - Other:_____
- Did any of the following experiences influence your decision in choosing your field of study? (Check all that apply)
    - High school courses
    - College course
    - Job
    - Volunteer work
    - Extracurricular activities
    - Movie or book
    - Trip or vacation
    - Youth camp
    - Other:_____
- Was a science course critical to you when choosing your field of study?
    - Yes
    - No
- Has your family ever discouraged you from entering a certain career path?
    - Yes
    - No
- Have you ever been discouraged from choosing a career path because you felt you were a minority within that specific current work field?
    - Yes
    - No

The following questions will identify your general knowledge and understanding of agriculture as a field of study and associated careers. Please answer to the best of your ability.

- Do you know what the term Agriculture industry refers to?
    - Yes
    - No
- Do you think there are a wide variety of job opportunities in the food and agriculture industry?
    - Yes
    - No
- Have you considered a career in the food and agriculture industry?
    - Yes

    - No
- Do you have a background in agriculture or food science? (Check all that apply)
    - Extracurricular involvement (4-H, FFA, etc.)
    - Agriculture courses (Food science, meat science, food safety, food microbiology, etc.)
    - Work Experience (Worked at a restaurant, worked at a butcher shop, etc.)
    - None of the above

- Have you ever received information relating to food and agriculture careers?
    - Yes
    - No
- Of the careers listed, check all of those that can be found in the food and agriculture industry.
    - Research Scientist
    - Computer Programming
    - Teacher
    - Hospitality Manager
    - Medical Doctor
    - Accountant
    - Journalism
    - Microbiologist
    - Product Development
    - Lawyer
    - Public Relations
    - Quality Control Manager
    - Engineer
    - Law enforcement
    - Academia (University)
    - Safety

If you would like more information on careers in food and agriculture please email Dr. Branham in the Agriculture Department at Angelo State University. Email: Loree.branham@angelo.edu

Thank you for your time and input!